Response to Reviewer #2's comments

This work investigated the emissions of ROGs from five industrial VCP sources in China, including shoemaking, plastic surface coating, furniture coating and shipping coating industries. PTR-ToF-MS and GC-MS/FID are combined together to develop comprehensive speciation of VOC from these industrial sources in PRD, China. The manuscript is generally well organized. Some statements are unclear and need to be clarified. I also suggest authors polish English and grammar throughout the manuscript. Please see below for my detailed comments.

Reply: We would like to thank you for your insightful comments, which helped us tremendously in improving the quality of our work. We have checked the grammar and syntax throughout the manuscript and the supplement. Please find our responses to individual comments below.

1.Abstract: This work is only for PRD, China, instead of the whole nation. Please clarify this in the title and abstract to avoid misunderstanding.

Reply: Thanks for your suggestion. We have modified this description in the title and abstract.

The title in the revised manuscript is modified to:

Emission characteristics of reactive organic gases from industrial volatile chemical products (VCPs) in the Pearl River Delta (PRD), China

The sentence in the Abstract (line 21-24) is modified to:

This study aimed to investigate the emissions of ROGs from five industrial VCP sources in the Pearl River Delta (PRD) region of China, including shoemaking, plastic surface coating, furniture coating, printing, and ship coating industries.

2.Line 30: Not sure what this sentence means. Please keep in mind that this study doesn't cover all emission sources. Please clarify this sentence to avoid misunderstanding.

Reply: Thanks for your suggestion. We have modified this description here.

The sentence in the Abstract (line 30-32) is modified to:

Moreover, mass spectra similarity analysis revealed significant dissimilarities among the ROG emission from industrial activities, indicating substantial variations between different industrial VCP sources.

3.Line 32: so, what's the proportion of OVOCs for ship coating industry then? Does it make big difference using solvent-borne coatings or waterborne coatings for OVOC proportion?

Reply: Thanks for your suggestion. There is a significant difference in the proportion of OVOCs between solvent-borne coatings and water-borne coatings. We have included additional descriptions regarding the proportion of OVOCs in the ship coating industry.

The sentence in the Abstract (line 32-36) is modified to:

Except for the ship coating industry utilizing solvent-borne coatings, the proportions of OVOCs range from 67% to 96% in total ROG emissions and 72% to 97% in total OH reactivity (OHR) for different industrial sources, while the corresponding contributions of OVOCs in the ship coating industry are only 16%±3.5% and 15%±3.6%.

4.Line 37-39: please improve the statement.

Reply: Thanks for your suggestion. We have re-wording this sentence.

The sentence in the Abstract (line 39-41) is modified to:

We find that a few species can contribute the majority of the ROG emissions, and also their OHR and OFP from various industrial VCP sources.

5.Line 41: Why is the treatment efficiency negative?

Reply: Thanks for your suggestion. The negative treatment efficiency of ROG was obtained in the furniture coating industry, as shown in the discussion in Section 3.3. This treatment device demonstrates inefficiency for all ROG groups. The inadequate performance of the ROG treatment devices in this specific facility may be attributed to a number of possible reasons, e.g., delayed replacement of activated carbon and other adsorption materials, and the implementation of the UV photolysis device could potentially result in the generation of more ROGs as byproducts.

6.Line 74: Not accurate statement. The substitution of solvent-borne VCPs by water-borne ones are for several sources., e.g., interior wall painting.

Reply: Thanks for your suggestion. The substitution of solvent-borne VCPs by water-borne VCPs are not for all of industrial VCP sources. We have revised descriptions here.

The sentences in the Introduction (line 74-81) are modified to:

To mitigate the emissions of most primary pollutants, stricter emission standards have been implemented along with advancements in ROG treatment technologies in China. Specifically, water-borne VCPs has substituted solvent-borne VCPs in several industries, such as printing, interior wall coating, and automotive manufacturing. However, the replacement in steel structures, automotive plastic parts manufacturing and ship building industries remains below 3% (Mo et al., 2021;Li et al., 2019;Shi et al., 2023;Wang et al., 2023).

7.Line 159: I'm curious how to combine PTR-ToF-MS with GC-MS/FID measurements when they overlap? How to handle the un-known species?

Reply: Thanks for your suggestion. Careful consideration should be given to the overlap of ROG species in the combined measurements of PTR-ToF-MS and GC-MS/FID, to make sure that each species should only be considered once. Species that are not calibrated were semi-quantified using methods based on the kinetics of proton-transfer reactions of H_3O^+ with ROGs (Fig. S2). We have added some descrition about these in Section S2 in the Supplement.

The sentence in the Setion 2.1 (line 180-181) is modified to:

The selection of overlapping ROGs was similar to a previous study (Table. S2).

The sentences in the Setion S2 in the Supplment (line 85-92) are modified to:

In this study, a more comprehensive speciation of ROGs was achieved by the combination of GC-MS/FID and PTR-ToF-MS, the same ROG species from the combination measurement should be counted only once. All ROG species detected in this study is summarized in Table S2. Specifically, to facilitate comparison with traditional photochemical assessment monitoring stations (PAMS) species, C_6-C_{10} aromatics were identified using GC/MS-FID, while C_{10}-C_{12} alkanes were detected using NO^+ PTR-ToF-MS, as GC-MS/FID only containing the n-alkanes. For unknown ROG species, we used the semi-quantity based on the methods.

Table S2. Detailed information of ROG species measured by different instruments.

Components	Measurements	ROG species
OVOCs	PTR-H_3O^+	formula only including CHO
N/S-containing	PTR-H_3O^+	formula including CHN, CHS, CHON, CHOS, and CHONS
Heavy aromatics and monoterpenes	PTR-H_3O^+	monoterpenes, C_{11}-C_{20} aromatics, and polynuclear aromatic hydrocarbons (PAHs)
Higher alkanes	PTR-NO^+	C_{10}-C_{20} acyclic, cyclic and bicyclic alkanes
Alkanes	GC-MS/FID	C_2-C_9 alkanes
Alkenes	GC-MS/FID	C_2-C_6 alkenes
Aromatics	GC-MS/FID	C_6-C_{10} aromatics
Halohydrocarbons	GC-MS/FID	C_1-C_6 halohydrocarbons

8.Line 299: have you found any additional important OVOCs using PTR-ToF-MS? Please list them or at list some examples here.

Reply: Thanks for your suggestion. In the Introduction, we have discussed the utilization of PTR-ToF-MS to enhance the characterization of OVOC emissions from industrial VCPs. In addition, some OVOCs with high concentrations (i.e. acetates and acrylates) have been listed in the line 317-320 in the revised manuscript (line 294-296 in the original manuscript), which were seldom reported in previous studies.

Considering that this sentence seem to be abrupt here, we removed it in the revised manuscript.

Reference:

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